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Reform of Teacher Education in American Schools (Outline of Presentation)

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Reform of teacher education is not only a national priority in the United States but also an active area for research and scholarship in universities. This research has addressed diverse aspects of the problems that many see with current practices in this area. This paper describes current efforts in teacher education at the University of Illinois that address needs in teacher education in light of the recent emphasis on standards-based education.

Background

Many scholars have situated present realities in the context of the history of changes and recurring themes in schools and teacher preparation (Anderson, 1988; Cuban, 1993). Others have focused directly on current practices, seeking a deeper understanding of the daily life of teachers and how they accomplish their goals (Jackson, 1986; Lortie, 1975; Schon, 1991;Sizer, 1984). This has included major efforts devoted to understanding the lived experiences of students and teachers in marginalized communities (Rose, 1989). These studies of practice have been complemented by research aimed at characterizing what it is that teachers know and how they develop this knowledge (Cochran-Smith & Lytle, 1993; Fenstermacher, 1994; Harris, 1994), or at articulating more clearly what it really is that we want teachers to do (Buchman & Floden, 1993).

One theme that emerges in these writings is the embeddedness of teaching practice in larger societal dynamics of market-driven economics; race, class and gender relations; cultural conflicts; and the numbing effects of large bureaucratic structures. This is a dispiriting theme, especially if one views the central goal of education in America to be to achieve the great social experiment of democracy in a diverse society, for those societal dynamics often appear little affected by the actions of educators. Nevertheless, few of these writers end on a note of despair. For example, Mike Rose, in *Lives on the Boundary* (1989), a book that chronicles exclusions and learned inability, threads throughout a vision of democratic education and achievement despite obstacles. The book ends with a call for hope:

...I realize that, finally, this is why the current perception of educational need is so limited: It substitutes terror for awe. But it is not terror that fosters learning, it is hope, everyday heroics, the power of the common play of the human mind.

This idea of hope pervades much of the writing on teacher education, especially that which delineates paths for effecting change. Various aspects of this work have been directed at improving teacher preparation (Loucks-Horsley, 1997a, 1997b; Goodlad, 1990), at reforming the structures and support for school leadership (Clift, Johnson, Holland, & Veal, 1992), or at making better use of new technologies to support teaching and teacher education (Levin, Waugh, Brown, & Clift, 1994). Increasingly, comparative research (Easley & Easley, 1992; Smith, 1989) has been seen as a way to gain new insights for improvement in American education. The best of this research integrates the unique historical and cultural context for American schools with the insights that can be gained from the experiences of other countries.

Most teacher educators are acutely aware of the daunting task of preparing teachers to in turn lead their students into 21st century, and few would propose any simple or guaranteed model for successful professional preparation. Nevertheless, there are promising approaches that suggest at least frameworks for collaborative work on the problem. In this paper, I will not attempt by any means to give a comprehensive account of this diverse body of research. Instead, I intend to focus my discussion around specific cases that fit within this larger framework. My account is limited in several ways. First, I will emphasize teacher education reform in the area of science and technology. Second, I will primarily consider preparation for elementary school teaching. Third, I will focus on activities at the University of Illinois in Urbana-Champaign, specifically ones in which I am directly participating.

Needs in Teacher Education

The idea of "crisis" has been a recurring theme in writings about American education (Berliner & Biddle, 1996). This dismal view is conveyed by commentators across the political spectrum and persists whether economic times are good or bad. But major long-term measures indicate gradual improvement in schooling generation by generation, across genders, and major ethnic and racial categories. For example, high school graduation rates in the US at the turn of the century were around 6-8%; by the 1920s they had reached 17-29%; and by the 1940s had climbed to 51-59%. For the last 25 years they have remained steady at or above 80%, and are now among the highest in the world (Green, 1994; Marable, 1993; White, 1987). University graduation rates are now around 23% for both women and men, the highest in the world. Achievement test scores, IQ scores, and other achievement measures also show steady, long-term improvement for every group (Berliner & Biddle, 1996).

Another indicator is the purchase of books and magazines. Annual sales of books are at an all-time high in the US and growing (McGuire, 1995), as are sales of academic journals (Leslie, 1994). There are also many indications that more people use more reading and writing in their work and leisure than ever before and that the rates are

rising despite television (Newman, 1991), the imputed inadequate schools and breakdown of the social order.

Although there have been major improvements in recent decades in the education and achievement levels for nearly all students, there are still glaring inequities and structural problems, many of which relate directly to teacher education. In September, 1996, the National Commission on Teaching & America's Future issued a major report on the condition of the teaching profession in America. The report, What Matters Most: Teaching & America's Future, summarizes familiar statistics highlighting the need for attention to issues of teacher development:

- America will need to hire two million teachers in the next decade due to increased student enrollment and the retirement of an aging teaching force.
- Almost 30% of our student population is minority, while minorities comprise only 13% of our teaching force. Over 40% of schools in the U.S. do not have a person of color on their faculty.
- 22% of all new teachers leave the profession in the first three years because of a lack of support & a "sink or swim" approach to induction.
- Although no state will permit a person to write wills, practice medicine, fix plumbing, or style hair without completing training & passing an examination, more than 40 states allow districts to hire teachers who have not met these basic requirements.
- Roughly one-fourth of newly hired teachers lack the qualifications for their jobs.
- 75% of urban districts admit hiring teachers without proper qualifications.
- Nearly one-fourth (23%) of all secondary teachers do not have even a minor in their main teaching field. This is true for more than 30% of mathematics teachers. In schools with the highest minority enrollments, students have less than a 50% chance of getting a science or mathematics teacher who holds a license & a degree in the field he or she teaches.

Standards for Professional Development of Elementary Science Teachers

In the United States, most elementary school teachers teach all the subjects: reading, writing, mathematics, social studies, science. Occasionally there are specialists for art and music, but what are considered the core academic subjects are usually taught by one teacher. This means, for example, that every program to certify elementary school teachers must prepare its students fully to be science teachers.

Over the last decade there have been a variety of projects directed by non-governmental organizations to define standards for teaching, curriculum, and assessment. In 1989, the American Association for the Advancement of Science's Project 2061 published an influential report to define "science literacy." Called Science for All Americans, it included not just natural science but also social science, mathematics, engineering and technology, and their interconnections (Rutherford & Ahlgren, 1990). This definition of science reflected the view that reform of teaching in any domain of science, mathematics, or technology cannot ignore the others. A 1993

publication, Benchmarks for Science Literacy, describes a set of K-12 learning goals for these domains.

Other organizations have recently developed learning goals for their disciplines. In 1989, the National Council of Teachers of Mathematics published Curriculum and Evaluation Standards for School Mathematics, and two years later, Professional Standards for Teaching Mathematics. In 1994, the National Council for the Social Studies published Curriculum Standards for Social Studies.

Last year, the National Research Council of the National Academy of Sciences (1996) published the National Science Education Standards detailing standards for science teaching, professional development for teachers, assessment, science content, school science programs, and national education policy. In the area of teacher education, the standards state:

- Professional development for teachers of science requires learning essential science content through the perspectives and methods of inquiry.
- Professional development for teachers of science requires integrating knowledge of science, learning, pedagogy, and students; it also requires applying that knowledge to science teaching.
- Professional development for teachers of science requires building understanding and ability for lifelong learning.
- Professional development programs for teachers of science must be coherent and integrated.
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Also, last year, the International Society for Technology in Education drafted a set of 18 competencies, intended for all preservice education students. The National Council for Accreditation of Teacher Education accepted the ISTE standards as goals for all teachers in training. Professional studies culminating in the educational computing and technology literacy endorsement prepare candidates to use computers and related technologies in educational settings. These competencies are grouped into three major categories:

- Candidates will use computer systems to run software; to access, generate and manipulate data; and to publish results. They will also evaluate performance of hardware and software components of computer systems and apply basic troubleshooting strategies as needed.
- Candidates will apply tools for enhancing their own professional growth and productivity. They will use technology in communicating, collaborating, conducting research, and solving problems. In addition, they will plan and participate in activities that encourage lifelong learning and will promote equitable, ethical, and legal use of computer/technology resources.
- Candidates will apply computers and related technologies to support instruction in their grade level and subject areas. They must plan and deliver instructional units that integrate a variety of software, applications, and learning tools. Lessons

developed must reflect effective grouping and assessment strategies for diverse populations.

The Embryology Project

The *Embryology Project* (Bruce, et al., 1997) is an innovative approach to teaching science and technology that addresses the new technology, science, and mathematics standards. The project started as an experiment to see whether students and teachers could control an MRI system to study the maturation of a chicken embryo during its 21 days of development. The MRI system allowed for real-time data acquisition, instrument control, and data processing through a standard WWW browser interface called NWebScope. Its current version introduces teachers and students to interactive, real-time Magnetic Resonance Imaging (MRI), makes available many resources on the World Wide Web (WWW), and assists students and teachers in their collaborative construction of a Web site. These uses of new technologies augment the study of chicken eggs frequently carried out in K-12 classrooms to learn about embryonic development. (Local agricultural extension services often provide schools with curriculum materials for this purpose.)

The initial project appears to be quite successful. As one middle school teacher said, My students gained knowledge about embryonic development and MRI. They learned new skills in using the World Wide Web and e-mail. My students also felt as though they were a community of learners playing an integral role in a project. They felt like respected people who were given control of an expensive machine. This control of their learning in turn provides motivation and interest towards learning science.

This year we have incorporated the *Embryology Project* into the preservice program for elementary school teachers. This is part of a course taught in room 4 of the Education building. On October 29, the embryos will be 9 days old, and if we are successful, chicks will hatch on November 10. Students will examine MRI images of chicken embryos through the WWW, which they may then compare to low-tech procedures such as dissection and candling.

We have applied for support for 30 Champaign County K-12 teachers to participate in a professional development training program during the Spring, Summer, and Fall semesters in 1998. This project will demonstrate a capacity for sustainable systemic improvement in mathematics and science education. Participating teachers will actively collaborate with 120 preservice teachers from the College of Education, and with several interdisciplinary faculty and staff members during the project. The project offers potential for producing a "best practice" model for inquiry-based learning and teaching with emerging technologies. It also addresses the new national standards for science and technology teaching.

Major Issues

- Accountability/professionalization
- National policy versus local control
- Resources; impact on four- versus five-year programs

- Diversity of student and teacher populations
- Basic skills versus higher-order thinking

Conclusion: The Art of Teaching

[Lucy Calkins' quote]

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